



Bayer Aktiengesellschaft

<120> Nucleic Acids which encode
insect acetylcholine receptor subunits

<130> Le A 33 020-Foreign Countries

<140> US/09/303,232

<141> 1999-04-30

<150> DE 198 19 829.9

<151> 1998-05-04

<160> 6

<170> PatentIn Ver. 2.1

<210> 1

<211> 2886

<212> DNA

<213> Drosophila melanogaster

<220>

<221> CDS

<222> (372) .. (2681)

<400> 1

ggcagcagagaa aaagttgtgg tataaacttt tattgttagga aaacgcataa aaataataga 60
aaaacgctct tcgggttgta aagaaaataa gaagacaaaa gaaagacatg aaaacgttgc 120
aaacaataaaa gcatatactt gccatattga tataaaggga aatcgtgaaa aggcgggtgaa 180
aatttcgtaa gattagttgg tattaagggc agcccatgca cacagctaaa aagggaacta 240
aaaaaacccc gcacagaaca atgaaagctg cagcagctgg ataaggccga caaaaccgaa 300
aattatatta ttgtaatcta gtagagagca gacaacatat ccgctggcaa caaccaacac 360
cgaaagagac t atg aaa aat gca caa ctg aaa ctg act gaa gtt gac gat 410
Met Lys Asn Ala Gln Leu Lys Leu Thr Glu Val Asp Asp
1 5 10
gat gag ctg tgg ctg gca gta aga tta gcg cac tgc agc agc aac ttt 458
Asp Glu Leu Trp Leu Ala Val Arg Leu Ala His Cys Ser Ser Asn Phe
15 20 25
agc agc agt agc agc aca aga acc acc agc agc aac cag agg cac aac 506
Ser Ser Ser Ser Ser Thr Arg Thr Thr Ser Ser Asn Gln Arg His Asn
30 35 40 45
cag caa ctc aca aca ctg caa cca agg agc tta agt aca aaa cac cac 554
Gln Gln Leu Thr Thr Leu Gln Pro Arg Ser Leu Ser Thr Lys His His
50 55 60
agc aac att gca agc gag cag cac aat agc cag caa cag gag cca gca 602
Ser Asn Ile Ala Ser Glu Gln His Asn Ser Gln Gln Gln Glu Pro Ala
65 70 75

tcg aag gac gag gat gta gcc aac cac ggt aga agc aat gac cag cag 650
Ser Lys Asp Glu Asp Val Ala Asn His Gly Arg Ser Asn Asp Gln Gln
80 85 90

acg cat ctg caa cag cta gac agc agc aac atg ttg tcg cca aag aca 698
Thr His Leu Gln Gln Leu Asp Ser Ser Asn Met Leu Ser Pro Lys Thr
95 100 105

gcc gca gca gca act gct gcc ggc gat gaa gca aca acc caa caa cca 746
Ala Ala Ala Ala Thr Ala Ala Gly Asp Glu Ala Thr Thr Gln Gln Pro
110 115 120 125

aca aac ata aga ctg tgt gca cgc aag cga caa cga ttg cgt cgc cga 794
Thr Asn Ile Arg Leu Cys Ala Arg Lys Arg Gln Arg Leu Arg Arg Arg
130 135 140

cga aaa aga aaa cca gca acc cca aac gaa aca gat atc aag aaa caa 842
Arg Lys Arg Lys Pro Ala Thr Pro Asn Glu Thr Asp Ile Lys Lys Gln
145 150 155

cag caa ctt agc atg cct ccc ttc aaa acg cgc aaa tcc acg gac acc 890
Gln Gln Leu Ser Met Pro Pro Phe Lys Thr Arg Lys Ser Thr Asp Thr
160 165 170

tac agc aca cca gca gca aca acc agc tgt ccg aca gcc acc tac atg 938
Tyr Ser Thr Pro Ala Ala Thr Thr Ser Cys Pro Thr Ala Thr Tyr Met
175 180 185

caa tgt cga gcc agc gac aat gag ttc agt att ccg ata tcg aga cat 986
Gln Cys Arg Ala Ser Asp Asn Glu Phe Ser Ile Pro Ile Ser Arg His
190 195 200 205

gat aga gta tcc acg gcc aca ttc gcc tgg gtg ttg cat gtg ctg cag 1034
Asp Arg Val Ser Thr Ala Thr Phe Ala Trp Val Leu His Val Leu Gln
210 215 220

gtg ctg ctc gtg tcg ctg caa cag tgg caa ctt cac gtg caa cag cga 1082
Val Leu Leu Val Ser Leu Gln Gln Trp Gln Leu His Val Gln Gln Arg
225 230 235

tcg gtg cta ctg ttc aga agg atc gca gcg agc acc atc gcc ttc att 1130
Ser Val Leu Leu Phe Arg Arg Ile Ala Ala Ser Thr Ile Ala Phe Ile
240 245 250

tcc tat tta ggc agc ttt gca gcg caa ctg aaa aat agc agc agc agc 1178
Ser Tyr Leu Gly Ser Phe Ala Ala Gln Leu Lys Asn Ser Ser Ser Ser
255 260 265

agt agc agc agc aac agc agc aac aac agc agc acg caa ata tta aac 1226
Ser Ser Ser Ser Asn Ser Ser Asn Asn Ser Ser Thr Gln Ile Leu Asn
270 275 280 285

gga ctt aat aaa cac tca tgg ata ttt tta ttg ata tat ttg aat tta 1274
Gly Leu Asn Lys His Ser Trp Ile Phe Leu Leu Ile Tyr Leu Asn Leu
290 295 300

tct gct aaa gtt tgc cta gca gga tat cat gaa aag aga ctg tta cac 1322
Ser Ala Lys Val Cys Leu Ala Gly Tyr His Glu Lys Arg Leu Leu His
305 310 315

gat ctt ttg gat cct tat aat aca cta gaa cgt ccc gtt ctc aat gaa 1370
Asp Leu Leu Asp Pro Tyr Asn Thr Leu Glu Arg Pro Val Leu Asn Glu
320 325 330

tcg gac ccg tta caa tta agc ttt ggt tta act tta atg caa att atc 1418
Ser Asp Pro Leu Gln Leu Ser Phe Gly Leu Thr Leu Met Gln Ile Ile
335 340 345

gat gtg gac gag aaa aat caa ttg cta gtc act aat gtg tgg tta aaa 1466
Asp Val Asp Glu Lys Asn Gln Leu Leu Val Thr Asn Val Trp Leu Lys
350 355 360 365

ctg gag tgg aac gac atg aat ctc cgc tgg aac acc tcc gac tat ggc 1514
Leu Glu Trp Asn Asp Met Asn Leu Arg Trp Asn Thr Ser Asp Tyr Gly
370 375 380

gga gtt aag gat ctg cga ata ccg ccg cat cgc atc tgg aag ccg gac 1562
Gly Val Lys Asp Leu Arg Ile Pro Pro His Arg Ile Trp Lys Pro Asp
385 390 395

gtg ctg atg tac aac agt gcg gat gag gga ttt gac ggc acc tac cag 1610
Val Leu Met Tyr Asn Ser Ala Asp Glu Gly Phe Asp Gly Thr Tyr Gln
400 405 410

acg aac gtg gtg gtg cgg aac aac ggc tcg tgt cta tac gtt ccg ccg 1658
Thr Asn Val Val Val Arg Asn Asn Gly Ser Cys Leu Tyr Val Pro Pro
415 420 425

ggg atc ttc aag tcg acg tgc aag atc gac atc acg tgg ttc ccc ttc 1706
Gly Ile Phe Lys Ser Thr Cys Lys Ile Asp Ile Thr Trp Phe Pro Phe
430 435 440 445

gat gac cag ccg tgc gag atg aag ttc ggc agt tgg acc tac gac gga 1754
Asp Asp Gln Arg Cys Glu Met Lys Phe Gly Ser Trp Thr Tyr Asp Gly
450 455 460

ttc cag ctg gat tta caa tta caa gat gaa act ggc ggt gat atc agc 1802
Phe Gln Leu Asp Leu Gln Leu Gln Asp Glu Thr Gly Gly Asp Ile Ser
465 470 475

agt tac gtg ctc aac ggc gag tgg gaa cta ctg ggt gtg ccc ggc aaa 1850
Ser Tyr Val Leu Asn Gly Glu Trp Glu Leu Leu Gly Val Pro Gly Lys
480 485 490

cgt aac gag atc tat tac aac tgc tgc ccg gaa ccc tat ata gac atc 1898
Arg Asn Glu Ile Tyr Tyr Asn Cys Cys Pro Glu Pro Tyr Ile Asp Ile
495 500 505

acc ttc gcc atc atc atc cgc cga cga aca ctg tac tat ttc ttc aac 1946
Thr Phe Ala Ile Ile Ile Arg Arg Arg Thr Leu Tyr Tyr Phe Phe Asn
510 515 520 525

B1

ctg atc ata cct tgt gta ctg att gcc tcc atg gcc ttg ctc gga ttc 1994
Leu Ile Ile Pro Cys Val Leu Ile Ala Ser Met Ala Leu Leu Gly Phe
530 535 540

acc ctg ccg cca gat tcg ggt gaa aaa tta tcg ctg ggt gtt acc atc 2042
Thr Leu Pro Pro Asp Ser Gly Glu Lys Leu Ser Ser Leu Gly Val Thr Ile
545 550 555

ttg ctc tcg ctg acc gtg ttt ctg aat atg gtt gcc gag aca atg ccg 2090
Leu Leu Ser Leu Thr Val Phe Leu Asn Met Val Ala Glu Thr Met Pro
560 565 570

gct act tcc gat gcg gtg cca ttg tgg ata cgc atc gtg ttt ttg tgc 2138
Ala Thr Ser Asp Ala Val Pro Leu Trp Ile Arg Ile Val Phe Leu Cys
575 580 585

tgg ctg cca tgg ata ttg cga atg agt cgc cca gga cga ccg ctg atc 2186
Trp Leu Pro Trp Ile Leu Arg Met Ser Arg Pro Gly Arg Pro Leu Ile
590 595 600 605

cta gag ttc ccg acc acg ccc tgt tcg gac aca tcc tcc gag cgg aag 2234
Leu Glu Phe Pro Thr Thr Pro Cys Ser Asp Thr Ser Ser Glu Arg Lys
610 615 620

cac cag ata ctc tcc gac gtt gag ctg aaa gag cgc tcg tcg aaa tcg 2282
His Gln Ile Leu Ser Asp Val Glu Leu Lys Glu Arg Ser Ser Lys Ser
625 630 635

ctg ctg gcc aac gta cta gac atc gat gat gac ttc cgg cac aat tgt 2330
Leu Leu Ala Asn Val Leu Asp Ile Asp Asp Asp Phe Arg His Asn Cys
640 645 650

cgc ccc atg acg ccc ggc gga aca ctg cca cac aac ccg gct ttc tat 2378
Arg Pro Met Thr Pro Gly Gly Thr Leu Pro His Asn Pro Ala Phe Tyr
655 660 665

cgc acg gtt tat gga caa ggc gac gat ggc agc att ggg cca att ggc 2426
Arg Thr Val Tyr Gly Gln Gly Asp Asp Gly Ser Ile Gly Pro Ile Gly
670 675 680 685

agc acc cga atg ccg gat gcg gtc acc cat cat acg tgc atc aaa tca 2474
Ser Thr Arg Met Pro Asp Ala Val Thr His His Thr Cys Ile Lys Ser
690 695 700

tca act gaa tat gaa tta ggt tta atc tta aag gaa att cgc ttt ata 2522
Ser Thr Glu Tyr Glu Leu Gly Leu Ile Leu Lys Glu Ile Arg Phe Ile
705 710 715

act gat cag cta cgt aaa gat gac gag tgc aat gac att gcc aat gat 2570
Thr Asp Gln Leu Arg Lys Asp Asp Glu Cys Asn Asp Ile Ala Asn Asp
720 725 730

tgg aaa ttt gca gct atg gtc gtt gac aga ctg tgc ctt atc ata ttc 2618
Trp Lys Phe Ala Ala Met Val Val Asp Arg Leu Cys Leu Ile Ile Phe
735 740 745

B

aca atg ttc gca ata tta gcc aca ata gct gta cta cta tcg gca cca 2666
Thr Met Phe Ala Ile Leu Ala Thr Ile Ala Val Leu Leu Ser Ala Pro
750 755 760 765

cat att att gtc tcg tagccatatg ggcgaggtgg ttattgttat tggttttatt 2721
His Ile Ile Val Ser
770

ataaaatcaa tttgttaatt attaaattaa taacgaaact ctttaagtaa attaaaacta 2781

aaaagacact aaaaaagcac aaaaaaatag gaaaatacat gataaaaccc atgaactaaa 2841

taatacatcc aagaaaaacc aaaacaaaaa aaaaaaaaaa aaaaa 2886

<210> 2

<211> 770

<212> PRT

<213> Drosophila melanogaster

<400> 2

Met Lys Asn Ala Gln Leu Lys Leu Thr Glu Val Asp Asp Asp Glu Leu
1 5 10 15

Trp Leu Ala Val Arg Leu Ala His Cys Ser Ser Asn Phe Ser Ser Ser
20 25 30

Ser Ser Thr Arg Thr Thr Ser Ser Asn Gln Arg His Asn Gln Gln Leu
35 40 45

Thr Thr Leu Gln Pro Arg Ser Leu Ser Thr Lys His His Ser Asn Ile
50 55 60

Ala Ser Glu Gln His Asn Ser Gln Gln Gln Glu Pro Ala Ser Lys Asp
65 70 75 80

Glu Asp Val Ala Asn His Gly Arg Ser Asn Asp Gln Gln Thr His Leu
85 90 95

Gln Gln Leu Asp Ser Ser Asn Met Leu Ser Pro Lys Thr Ala Ala Ala
100 105 110

Ala Thr Ala Ala Gly Asp Glu Ala Thr Thr Gln Gln Pro Thr Asn Ile
115 120 125

Arg Leu Cys Ala Arg Lys Arg Gln Arg Leu Arg Arg Arg Arg Lys Arg
130 135 140

Lys Pro Ala Thr Pro Asn Glu Thr Asp Ile Lys Lys Gln Gln Gln Leu
145 150 155 160

Ser Met Pro Pro Phe Lys Thr Arg Lys Ser Thr Asp Thr Tyr Ser Thr
165 170 175

Pro Ala Ala Thr Thr Ser Cys Pro Thr Ala Thr Tyr Met Gln Cys Arg
180 185 190

Ala Ser Asp Asn Glu Phe Ser Ile Pro Ile Ser Arg His Asp Arg Val
195 200 205

Ser Thr Ala Thr Phe Ala Trp Val Leu His Val Leu Gln Val Leu Leu
210 215 220

Val Ser Leu Gln Gln Trp Gln Leu His Val Gln Gln Arg Ser Val Leu
225 230 235 240

Leu Phe Arg Arg Ile Ala Ala Ser Thr Ile Ala Phe Ile Ser Tyr Leu
245 250 255

Gly Ser Phe Ala Ala Gln Leu Lys Asn Ser Ser Ser Ser Ser Ser Ser
260 265 270

Ser Asn Ser Ser Asn Asn Ser Ser Thr Gln Ile Leu Asn Gly Leu Asn
275 280 285

Lys His Ser Trp Ile Phe Leu Leu Ile Tyr Leu Asn Leu Ser Ala Lys
290 295 300

Val Cys Leu Ala Gly Tyr His Glu Lys Arg Leu Leu His Asp Leu Leu
305 310 315 320

Asp Pro Tyr Asn Thr Leu Glu Arg Pro Val Leu Asn Glu Ser Asp Pro
325 330 335

Leu Gln Leu Ser Phe Gly Leu Thr Leu Met Gln Ile Ile Asp Val Asp
340 345 350

Glu Lys Asn Gln Leu Leu Val Thr Asn Val Trp Leu Lys Leu Glu Trp
355 360 365

Asn Asp Met Asn Leu Arg Trp Asn Thr Ser Asp Tyr Gly Gly Val Lys
370 375 380

Asp Leu Arg Ile Pro Pro His Arg Ile Trp Lys Pro Asp Val Leu Met
385 390 395 400

Tyr Asn Ser Ala Asp Glu Gly Phe Asp Gly Thr Tyr Gln Thr Asn Val
405 410 415

Val Val Arg Asn Asn Gly Ser Cys Leu Tyr Val Pro Pro Gly Ile Phe
420 425 430

Lys Ser Thr Cys Lys Ile Asp Ile Thr Trp Phe Pro Phe Asp Asp Gln
435 440 445

Arg Cys Glu Met Lys Phe Gly Ser Trp Thr Tyr Asp Gly Phe Gln Leu
450 455 460

Asp Leu Gln Leu Gln Asp Glu Thr Gly Gly Asp Ile Ser Ser Tyr Val
465 470 475 480

Leu Asn Gly Glu Trp Glu Leu Leu Gly Val Pro Gly Lys Arg Asn Glu
485 490 495

Ile Tyr Tyr Asn Cys Cys Pro Glu Pro Tyr Ile Asp Ile Thr Phe Ala
500 505 510

Ile Ile Ile Arg Arg Arg Thr Leu Tyr Tyr Phe Phe Asn Leu Ile Ile
515 520 525

Pro Cys Val Leu Ile Ala Ser Met Ala Leu Leu Gly Phe Thr Leu Pro
530 535 540

Pro Asp Ser Gly Glu Lys Leu Ser Leu Gly Val Thr Ile Leu Leu Ser
545 550 555 560

Leu Thr Val Phe Leu Asn Met Val Ala Glu Thr Met Pro Ala Thr Ser
565 570 575

Asp Ala Val Pro Leu Trp Ile Arg Ile Val Phe Leu Cys Trp Leu Pro
580 585 590

Trp Ile Leu Arg Met Ser Arg Pro Gly Arg Pro Leu Ile Leu Glu Phe
595 600 605

Pro Thr Thr Pro Cys Ser Asp Thr Ser Ser Glu Arg Lys His Gln Ile
610 615 620

Leu Ser Asp Val Glu Leu Lys Glu Arg Ser Ser Lys Ser Leu Leu Ala
625 630 635 640

Asn Val Leu Asp Ile Asp Asp Asp Phe Arg His Asn Cys Arg Pro Met
645 650 655

Thr Pro Gly Gly Thr Leu Pro His Asn Pro Ala Phe Tyr Arg Thr Val
660 665 670

Tyr Gly Gln Gly Asp Asp Gly Ser Ile Gly Pro Ile Gly Ser Thr Arg
675 680 685

Met Pro Asp Ala Val Thr His His Thr Cys Ile Lys Ser Ser Thr Glu
690 695 700

Tyr Glu Leu Gly Leu Ile Leu Lys Glu Ile Arg Phe Ile Thr Asp Gln
705 710 715 720

Leu Arg Lys Asp Asp Glu Cys Asn Asp Ile Ala Asn Asp Trp Lys Phe
725 730 735

Ala Ala Met Val Val Asp Arg Leu Cys Leu Ile Ile Phe Thr Met Phe
740 745 750

Ala Ile Leu Ala Thr Ile Ala Val Leu Leu Ser Ala Pro His Ile Ile
755 760 765

Val Ser
770

B1

<210> 3
<211> 3700
<212> DNA
<213> *Heliothis virescens*

<220>
<221> CDS
<222> (335)..(1822)

<400> 3
ggcacgagcc gctgccccac ggctcgccgc actccgctga acaacaatgc tcaaaaacac 60
gccgtgactc cacacacatc ccctcggcgc agtaggcgat gtttgaggat cggacggcac 120
gcgtggccgt cggcgagcgg tcgtgaacaa gttgcataca tatgaaaacc gtaaaaagat 180
tgaattttaa gccgatcgtg ttcgatagat cctaataagag aagcgggagt gcggcggttg 240
gtaggcgggg gtcgagtcgc gcggtcgggg gaaatggcgc ggcgcggggc ggcggcggcg 300
gcggcgcgcg gcggcggggc gtcgcgggcg tgac atg ggc ggg cgg gcg cgc cgc 355
Met Gly Gly Arg Ala Arg Arg
1 5
tcg cac ttg gcg gcg ccc gcg ggc ctg ctg ctg ctg ctg tgc ctg etc 403
Ser His Leu Ala Ala Pro Ala Gly Leu Leu Leu Leu Leu Cys Leu Leu
10 15 20
tgg ccg agg ggg gca cgc tgc ggg tac cac gag aag cgg cta ctg cac 451
Trp Pro Arg Gly Ala Arg Cys Gly Tyr His Glu Lys Arg Leu Leu His
25 30 35
cac cta ttg gac cac tac aac gta ctg gag agg ccc gtc gtc aac gag 499
His Leu Leu Asp His Tyr Asn Val Leu Glu Arg Pro Val Val Asn Glu
40 45 50 55
agc gac ccg ctg cag ctc tcc ttc ggc ctc acg ctc atg cag atc atc 547
Ser Asp Pro Leu Gln Leu Ser Phe Gly Leu Thr Leu Met Gln Ile Ile
60 65 70
gac gtg gac gag aag aac cag ctt tta ata aca aac atc tgg cta aaa 595
Asp Val Asp Glu Lys Asn Gln Leu Leu Ile Thr Asn Ile Trp Leu Lys
75 80 85
cta gag tgg aat gat atg aac ttg agg tgg aac act tca gat ttc ggc 643
Leu Glu Trp Asn Asp Met Asn Leu Arg Trp Asn Thr Ser Asp Phe Gly
90 95 100
ggg gtc aaa gat tta aga gtg cca ccc cac aga cta tgg aaa cca gac 691
Gly Val Lys Asp Leu Arg Val Pro Pro His Arg Leu Trp Lys Pro Asp
105 110 115
gtc ctt atg tac aac agc gcg gac gaa ggg ttc gac agc acg tat cca 739
Val Leu Met Tyr Asn Ser Ala Asp Glu Gly Phe Asp Ser Thr Tyr Pro
120 125 130 135

acg aac gtg gtg gtg cgg aac aac ggc tgc tgt ctg tac gtg ccg ccc 787
 Thr Asn Val Val Val Arg Asn Asn Gly Ser Cys Leu Tyr Val Pro Pro
 140 145 150

ggc atc ttc aag agc acc tgc aag atc gac atc acc tgg ttc ccc ttc 835
 Gly Ile Phe Lys Ser Thr Cys Lys Ile Asp Ile Thr Trp Phe Pro Phe
 155 160 165

gac gac caa cga tgc gag atg aag ttt ggc agc tgg act tat gat ggt 883
 Asp Asp Gln Arg Cys Glu Met Lys Phe Gly Ser Trp Thr Tyr Asp Gly
 170 175 180

tat cag ttg gat cta caa cta cag gat gaa ggg ggc gga gat ata agc 931
 Tyr Gln Leu Asp Leu Gln Leu Gln Asp Glu Gly Gly Gly Asp Ile Ser
 185 190 195

agt ttt gtc acg aat ggc gaa tgg gag tta ata gga gtc ccc ggc aag 979
 Ser Phe Val Thr Asn Gly Glu Trp Glu Leu Ile Gly Val Pro Gly Lys
 200 205 210 215

cgc aac gag atc tac tac aac tgt tgt ccg gag cca tac atc gac atc 1027
 Arg Asn Glu Ile Tyr Tyr Asn Cys Cys Pro Glu Pro Tyr Ile Asp Ile
 220 225 230

acg ttt gcg gtg gtg atc cgg agg aaa acg ctc tac tac ttc ttc aat 1075
 Thr Phe Ala Val Val Ile Arg Arg Lys Thr Leu Tyr Tyr Phe Phe Asn
 235 240 245

ctg atc gtg ccc tgc gtg ctc atc gcc tcc atg gct cta ttg ggg ttc 1123
 Leu Ile Val Pro Cys Val Leu Ile Ala Ser Met Ala Leu Leu Gly Phe
 250 255 260

acc ttg cct cca gac tcc gga gaa aag ttg tct tta ggt gtg acg ata 1171
 Thr Leu Pro Pro Asp Ser Gly Glu Lys Leu Ser Leu Gly Val Thr Ile
 265 270 275

tta ctg tgc ttg acg gtg ttc ctc aac atg gtg gcg gag acg atg cca 1219
 Leu Leu Ser Leu Thr Val Phe Leu Asn Met Val Ala Glu Thr Met Pro
 280 285 290 295

gcg acg tgc gac gcc gtg ccc ttg ctc ggc acc tac ttc aac tgc atc 1267
 Ala Thr Ser Asp Ala Val Pro Leu Leu Gly Thr Tyr Phe Asn Cys Ile
 300 305 310

atg ttc atg gtg gct tcc tcc gtc gtc tcc acc ata ctg atc ctc aac 1315
 Met Phe Met Val Ala Ser Ser Val Val Ser Thr Ile Leu Ile Leu Asn
 315 320 325

tac cac cac cgg cac gca gac act cac gaa atg agt gat tgg att cgt 1363
 Tyr His His Arg His Ala Asp Thr His Glu Met Ser Asp Trp Ile Arg
 330 335 340

tgc gtg ttc ctt tat tgg ctg ccg tgg gtg ctg cgc atg tca cgg ccc 1411
 Cys Val Phe Leu Tyr Trp Leu Pro Trp Val Leu Arg Met Ser Arg Pro
 345 350 355

ggc tcg gcg acg acg ccg ccg ccg gcg cgc gta cct ccg ccg ccg gac 1459
Gly Ser Ala Thr Thr Pro Pro Pro Ala Arg Val Pro Pro Pro Pro Asp
360 365 370 375

ctg gag ctg cgc gag cgc tcc tcc aag tcg ctc cta gcg aac gtg ctc 1507
Leu Glu Leu Arg Glu Arg Ser Ser Lys Ser Leu Leu Ala Asn Val Leu
380 385 390

gac atc gat gac gac ttc cgc cac ccg caa gcg cag cag ccg caa tgc 1555
Asp Ile Asp Asp Asp Phe Arg His Pro Gln Ala Gln Gln Pro Gln Cys
395 400 405

tgc cga tac tac agg ggg ggt gag gag aat ggc gcg ggg ttg gcg gcg 1603
Cys Arg Tyr Tyr Arg Gly Gly Glu Glu Asn Gly Ala Gly Leu Ala Ala
410 415 420

cac agt tgc ttc ggt gtc gac tac gag ctc tcc ctc att ctg aag gag 1651
His Ser Cys Phe Gly Val Asp Tyr Glu Leu Ser Leu Ile Leu Lys Glu
425 430 435

att aga gtc atc aca gat cag atg cgc aag gac gac gaa gat gcg gac 1699
Ile Arg Val Ile Thr Asp Gln Met Arg Lys Asp Asp Glu Asp Ala Asp
440 445 450 455

att tcg cgc gac tgg aag ttc gcc gcc atg gtc gtg gac aga ctg tgc 1747
Ile Ser Arg Asp Trp Lys Phe Ala Ala Met Val Val Asp Arg Leu Cys
460 465 470

ctt att atc ttt acc ctg ttc aca atc atc gcc acg cta gcc gtg ctg 1795
Leu Ile Ile Phe Thr Leu Phe Thr Ile Ile Ala Thr Leu Ala Val Leu
475 480 485

ctg tcc gcg cca cac atc atg gtg tcg tagcgacccg cccgcttgcg 1842
Leu Ser Ala Pro His Ile Met Val Ser
490 495

gatacgcatg cgaaaagtgc tgtgataccg cgaatatttg ttaagttgtg atgagcgaag 1902

tggcgcgagc ggtgacgccg cggcgctcgga gttgccgccg cctgcctcgc cgcccgcgcc 1962

cccctgtaga cataagttac cgctgactgc caaccctgta cgttcaacaa ataactgccc 2022

atccgactaa cgtcttttat ccccttgaaa aattcagcga ttgtgtaccc ctttcttcca 2082

agaatacaat gacaaatggt cgtcacgctc agtggaatca atcccgtact cttcgcccga 2142

tatttccctt agggatatgtc acgagtttga atgagcgggt ccgtatcaga cgttccgtcc 2202

ccggaacggt cgtcccctgc gataaagtgg cagtacgtgc tatacaggca cttaaggccg 2262

ccacgccacg gcgcgcgggt gcgctcgggc cgcgaacccg cgaccctcac cgctgcaagt 2322

ggccacccac tagacaagac tgcggcagaa aatatttgca caaaaacgtc ttccttctta 2382

ccgatgaacg acctgattcg catttaaaat taaactttgt tagaacttct tcgattcttg 2442

aaatctattg tacagtttag agtttgggcg gtgaaacaat ggccctttgt ttccttcttg 2502

ttcgattcca tgaatcgtgg ttataatccc tagttttatt ttcggatata tttgtgtcag 2562
tagctagtat agaactttac aaacaatggt gattcaattg gtacagggtg tgatatgcct 2622
cgttgtgaac ggggtccgata ttgttataaa tggtaaaata cccatggcta tagcttaata 2682
aatcgttcgt taaaagttgt agttaaacaa atattatttt aataaagtca tatctgggtc 2742
ttccggaacg actttttacaa ataattaaat tacatattaa tatcacgttt gtacttcttt 2802
ccatacagtt acagtaattc gtatgctgaa aataatatta gcttgtaaaa ttttcttctt 2862
cgaaaattta ttcaaacaga tgcgaccatc gtttcaaaca tttacatgta atatagaact 2922
cattttataa gatatacaac atttttataag tacaagaagt tgtaacatga accgggtttt 2982
cgttacatag aggggtataac acaaagggtgc ctacatattg acagatgcga agcacgatca 3042
gttgataagc acaggtacac tatatcctga catccgacag tcctgccgct cgtctgccac 3102
actcggaaac attcgacagt tcagtttact gctccgccat catcgattgt taagtttggt 3162
gttctaactc atcgattca tttcattcaa aaacattgta aacctctcaa ggggaaaacg 3222
tggtgtaaac agtgagagtg cgcggttaca accgacacgc gaatgtacc cgcgaaggct 3282
cctgtaatgt tttctcttc cgaggtgttg ctgagagtaa tcttagacgg tccgatggaa 3342
gttgcggaacc ggatatgatt acaagtcaat gtttttaagt catccgttta tttattgtta 3402
tatcttctta ccattcgta gaggttgtgt gacgaccgg acggtgggcg ccgcaaccg 3462
cacacgcggg gttccatctt tgtattagat ggaagttgt cgcatctct ccgtcggcaa 3522
tgggacaacc cgttgtcccc aacatttggt caattgtag ggttaactct gaattgcact 3582
ttgtttatta aatataaacg aatgaaacaa aaaaaaaaaa aaaaaactcg agagtacttc 3642
tagagcggcc gcgggcccac cgattttcca cccgggtggg gtaccagtaa gtgtacc 3700

<210> 4

<211> 496

<212> PRT

<213> *Heliothis virescens*

<400> 4

Met Gly Gly Arg Ala Arg Arg Ser His Leu Ala Ala Pro Ala Gly Leu
1 5 10 15

Leu Leu Leu Leu Cys Leu Leu Trp Pro Arg Gly Ala Arg Cys Gly Tyr
20 25 30

His Glu Lys Arg Leu Leu His His Leu Leu Asp His Tyr Asn Val Leu
35 40 45

Glu Arg Pro Val Val Asn Glu Ser Asp Pro Leu Gln Leu Ser Phe Gly
50 55 60

Leu Thr Leu Met Gln Ile Ile Asp Val Asp Glu Lys Asn Gln Leu Leu
65 70 75 80

Ile Thr Asn Ile Trp Leu Lys Leu Glu Trp Asn Asp Met Asn Leu Arg
85 90 95

Trp Asn Thr Ser Asp Phe Gly Gly Val Lys Asp Leu Arg Val Pro Pro
100 105 110

His Arg Leu Trp Lys Pro Asp Val Leu Met Tyr Asn Ser Ala Asp Glu
115 120 125

Gly Phe Asp Ser Thr Tyr Pro Thr Asn Val Val Val Arg Asn Asn Gly
130 135 140

Ser Cys Leu Tyr Val Pro Pro Gly Ile Phe Lys Ser Thr Cys Lys Ile
145 150 155 160

Asp Ile Thr Trp Phe Pro Phe Asp Asp Gln Arg Cys Glu Met Lys Phe
165 170 175

Gly Ser Trp Thr Tyr Asp Gly Tyr Gln Leu Asp Leu Gln Leu Gln Asp
180 185 190

Glu Gly Gly Gly Asp Ile Ser Ser Phe Val Thr Asn Gly Glu Trp Glu
195 200 205

Leu Ile Gly Val Pro Gly Lys Arg Asn Glu Ile Tyr Tyr Asn Cys Cys
210 215 220

Pro Glu Pro Tyr Ile Asp Ile Thr Phe Ala Val Val Ile Arg Arg Lys
225 230 235 240

Thr Leu Tyr Tyr Phe Phe Asn Leu Ile Val Pro Cys Val Leu Ile Ala
245 250 255

Ser Met Ala Leu Leu Gly Phe Thr Leu Pro Pro Asp Ser Gly Glu Lys
260 265 270

Leu Ser Leu Gly Val Thr Ile Leu Leu Ser Leu Thr Val Phe Leu Asn
275 280 285

Met Val Ala Glu Thr Met Pro Ala Thr Ser Asp Ala Val Pro Leu Leu
290 295 300

Gly Thr Tyr Phe Asn Cys Ile Met Phe Met Val Ala Ser Ser Val Val
305 310 315 320

Ser Thr Ile Leu Ile Leu Asn Tyr His His Arg His Ala Asp Thr His
325 330 335

Glu Met Ser Asp Trp Ile Arg Cys Val Phe Leu Tyr Trp Leu Pro Trp
340 345 350

Val Leu Arg Met Ser Arg Pro Gly Ser Ala Thr Thr Pro Pro Pro Ala
355 360 365

Arg Val Pro Pro Pro Pro Asp Leu Glu Leu Arg Glu Arg Ser Ser Lys
370 375 380

Ser Leu Leu Ala Asn Val Leu Asp Ile Asp Asp Asp Phe Arg His Pro
385 390 395 400

Gln Ala Gln Gln Pro Gln Cys Cys Arg Tyr Tyr Arg Gly Gly Glu Glu
405 410 415

Asn Gly Ala Gly Leu Ala Ala His Ser Cys Phe Gly Val Asp Tyr Glu
420 425 430

Leu Ser Leu Ile Leu Lys Glu Ile Arg Val Ile Thr Asp Gln Met Arg
435 440 445

Lys Asp Asp Glu Asp Ala Asp Ile Ser Arg Asp Trp Lys Phe Ala Ala
450 455 460

Met Val Val Asp Arg Leu Cys Leu Ile Ile Phe Thr Leu Phe Thr Ile
465 470 475 480

Ile Ala Thr Leu Ala Val Leu Leu Ser Ala Pro His Ile Met Val Ser
485 490 495

<210> 5
<211> 3109
<212> DNA
<213> *Heliothis virescens*

<220>
<221> CDS
<222> (95)..(1597)

<400> 5
ggcagcagcc ggccgcacgt tgtcccaggc cgcattgagcg cgccggcgtg ctagegcagc 60
gtgcgcgggt gtggtatgcc cgcgcgtcgc cgct atg gcc cct atg ttg gcg gcc 115
Met Ala Pro Met Leu Ala Ala
1 5

ttg gcg ctg ctg gct ttg ctg ccc gta tcg gag caa ggt cct cac gag 163
Leu Ala Leu Leu Ala Leu Leu Pro Val Ser Glu Gln Gly Pro His Glu
10 15 20

aag aga ctc ctg aac gcg ttg ctg gcg aac tac aac acc ctg gag cga 211
Lys Arg Leu Leu Asn Ala Leu Leu Ala Asn Tyr Asn Thr Leu Glu Arg
25 30 35

ccg gtg gcc aac gag agc gaa ccg cta gag gtc agg ttc ggc ttg acc 259
Pro Val Ala Asn Glu Ser Glu Pro Leu Glu Val Arg Phe Gly Leu Thr
40 45 50 55

ttg cag caa atc att gac gtg gac gag aag aat caa cta ctt ata acc 307
Leu Gln Gln Ile Ile Asp Val Asp Glu Lys Asn Gln Leu Leu Ile Thr
60 65 70

B

aat ata tgg ctg tcg ttg gag tgg aat gac tac aac ctg agg tgg aac 355
 Asn Ile Trp Leu Ser Leu Glu Trp Asn Asp Tyr Asn Leu Arg Trp Asn
 75 80 85

gac agc gag tat ggc ggg gtc aag gac ctc agg atc acg ccc aac aag 403
 Asp Ser Glu Tyr Gly Gly Val Lys Asp Leu Arg Ile Thr Pro Asn Lys
 90 95 100

ttg tgg aag ccg gac gtc ctt atg tat aat agt gct gac gag ggt ttt 451
 Leu Trp Lys Pro Asp Val Leu Met Tyr Asn Ser Ala Asp Glu Gly Phe
 105 110 115

gac ggg acc tac cag acc aac gtg gtg gtc aga agc ggc ggc agt tgc 499
 Asp Gly Thr Tyr Gln Thr Asn Val Val Val Arg Ser Gly Gly Ser Cys
 120 125 130 135

ctg tac gtg cca cct ggc ata ttc aag agc aca tgc aag atg gac atc 547
 Leu Tyr Val Pro Pro Gly Ile Phe Lys Ser Thr Cys Lys Met Asp Ile
 140 145 150

gcg tgg ttt ccc ttc gac gac caa cac tgt gat atg aag ttc ggt agc 595
 Ala Trp Phe Pro Phe Asp Asp Gln His Cys Asp Met Lys Phe Gly Ser
 155 160 165

tgg aca tat gac ggc aat cag ttg gat ctg gtg cta aaa gat gag gca 643
 Trp Thr Tyr Asp Gly Asn Gln Leu Asp Leu Val Leu Lys Asp Glu Ala
 170 175 180

ggc ggc gat cta tcg gac ttc ata aca aat ggg gag tgg tat cta ata 691
 Gly Gly Asp Leu Ser Asp Phe Ile Thr Asn Gly Glu Trp Tyr Leu Ile
 185 190 195

gga atg cca ggc aaa aag aac aca ata aca tac gcg tgc tgc ccc gag 739
 Gly Met Pro Gly Lys Lys Asn Thr Ile Thr Tyr Ala Cys Cys Pro Glu
 200 205 210 215

ccc tac gtg gac gtc acc ttc acc atc atg ata aga aga cga acc ttg 787
 Pro Tyr Val Asp Val Thr Phe Thr Ile Met Ile Arg Arg Arg Thr Leu
 220 225 230

tac tac ttc ttc aac ctg atc gtc ccg tgc gtg ctg atc tca tcg atg 835
 Tyr Tyr Phe Phe Asn Leu Ile Val Pro Cys Val Leu Ile Ser Ser Met
 235 240 245

gca ctc ctc ggc ttc aca ctg cca cca gac tcc gga gag aaa ctc aca 883
 Ala Leu Leu Gly Phe Thr Leu Pro Pro Asp Ser Gly Glu Lys Leu Thr
 250 255 260

ctt gga gtc act att ctt cta tcg ctg acg gtg ttc ctc aac ctg gta 931
 Leu Gly Val Thr Ile Leu Leu Ser Leu Thr Val Phe Leu Asn Leu Val
 265 270 275

gcc gag acc ctg cca cag gtc tcc gac gct atc ccc ctg tta ggg acg 979
 Ala Glu Thr Leu Pro Gln Val Ser Asp Ala Ile Pro Leu Leu Gly Thr
 280 285 290 295

B

tac ttc aat tgc atc atg ttc atg gta gcg tcg tct gtg gta ctg act 1027
 Tyr Phe Asn Cys Ile Met Phe Met Val Ala Ser Ser Val Val Leu Thr
 300 305 310

gtg gtg gta ctc aat tac cac cat cga aca gct gat ata cat gaa atg 1075
 Val Val Val Leu Asn Tyr His His Arg Thr Ala Asp Ile His Glu Met
 315 320 325

cca cag tgg ata aaa tca gta ttc cta caa tgg ttg cca tgg ata ctg 1123
 Pro Gln Trp Ile Lys Ser Val Phe Leu Gln Trp Leu Pro Trp Ile Leu
 330 335 340

cga atg tcg agg cca ggg aag aag atc acc agg aag act ata atg atg 1171
 Arg Met Ser Arg Pro Gly Lys Lys Ile Thr Arg Lys Thr Ile Met Met
 345 350 355

aac acg agg atg agg gag ctg gaa ctg aag gag agg tcg tcg aag tcc 1219
 Asn Thr Arg Met Arg Glu Leu Glu Leu Lys Glu Arg Ser Ser Lys Ser
 360 365 370 375

B1
 ttg ctg gcg aat gtt cta gat att gat gat gac ttc aga cac ggc cct 1267
 Leu Leu Ala Asn Val Leu Asp Ile Asp Asp Phe Arg His Gly Pro
 380 385 390

ccg cct cct aac agt act gcc tcg acc ggg aat ttg gga cct ggg tgc 1315
 Pro Pro Pro Asn Ser Thr Ala Ser Thr Gly Asn Leu Gly Pro Gly Cys
 395 400 405

tca ata ttc cgc acg gat ttc cgt cgg tcg ttc gtc cgt ccg tcc acg 1363
 Ser Ile Phe Arg Thr Asp Phe Arg Arg Ser Phe Val Arg Pro Ser Thr
 410 415 420

atg gaa gac gtg ggc ggc ggg ctg ggt agc cac cat cgc gag ctg cac 1411
 Met Glu Asp Val Gly Gly Gly Leu Gly Ser His His Arg Glu Leu His
 425 430 435

ctc ata ctg aga gag ctg cag ttc atc acg gcc agg atg aag aag gct 1459
 Leu Ile Leu Arg Glu Leu Gln Phe Ile Thr Ala Arg Met Lys Lys Ala
 440 445 450 455

gat gag gaa gcc gag ctg atc agc gac tgg aag ttt gct gcg atg gtt 1507
 Asp Glu Glu Ala Glu Leu Ile Ser Asp Trp Lys Phe Ala Ala Met Val
 460 465 470

gtt gat agg ttt tgc ctg ttc gtg ttc aca ctt ttc aca atc atc gcg 1555
 Val Asp Arg Phe Cys Leu Phe Val Phe Thr Leu Phe Thr Ile Ile Ala
 475 480 485

aca gta gct gtc ctg tta tcg gca ccg cat atc atc gtg caa 1597
 Thr Val Ala Val Leu Leu Ser Ala Pro His Ile Ile Val Gln
 490 495 500

tgaaccaacc actgagccgg caactccggc gcatgaatga gagaaataat tattagatcg 1657

ccgatttgta attataattg ataatgtaat taaattaaat acgtggttga aacgcacacg 1717

tctccataac aaagtcttaa gacattaaat tatgataaat ttacatattg tagttaagtc 1777

gagtgttgat ggaaatttta gccggcgcaa ggagtttcgt gaaggtctgt atatattttt 1837
tcttattggt gtatatgtga tcgttggtca tgttttcttt caggaagtga gctttgtact 1897
gtttgtttct tcgatggcag gtgcacttca gttcaggctg aaatttccat taacatttat 1957
ttaaacaat gtgatgttga ctaggatgtt atacagataa atgttgacgt gtataatttg 2017
ttaaataaaa caatattaat tactattact aaacgatatt ataaacgaag tactaacgag 2077
ggttacttta atgggaagaa cgctaagctg gcacagagtt gcattaattt gaaaaaagaa 2137
attacggaaa aaagtattt gaaaattgaa ctttttgtaa ggaaagtaac gtttgatcaa 2197
aaaagtttgt aaaacgaaag ttcggttctg cgccaatact ggaattaaaa ttctcgtaaa 2257
tattagggaa aagaaggtcc tttaaaacaa aagatttgaa ccggcatcct tttacaagt 2317
aatgagggat cacagatgat gacaaaaaac cttaggggtat ataagtaatg tacataatgg 2377
atcaaataatc ggtagagtca agaatagtta acgatttaag attattccat tcgatattaa 2437
aattcgatta gcgattgtcg ctgcgtctac tttgatacat atcgatttga atcgatattg 2497
tataaattta gatagatcgg acattagtaa tgagtatgga cgttttaatt tttaaaaaag 2557
aatgtactac gaagattaaa tccaggaatt gttaaacagt tatggaattg ataagaaatc 2617
aacaattaat acggaaccaa aggtagacta ggtgtagcat caggagattg aattaaaaca 2677
taaattagga ccgacttaaa tggaacttgc gagtgtattg ataacttttt aatttaaaaa 2737
ctcattgtcg attaaatgga gaataacttt tgatctctcg tatcgataaa tgctcactta 2797
actatcgata gcgtaatat attaaactgtta gtatatcgat atgggagtaa gtcactagca 2857
tcagaaatag tcattaatta ggaatcggtt tgtgttaatg ttatgcttag cgaaaatatt 2917
acaatgctgt tgatatcact aaccatcacg taaccatatt gataaaatgt aaatacagaa 2977
tattgcggtg tgtatttgta tataaatttt agaaaaaaaa aaaaaaaaaa aactcgagag 3037
tacttctaga gcggccgagg gcccatcgat tttccaccg ggtggggtac caggtaagtg 3097
tacccaattc gc 3109

<210> 6
<211> 501
<212> PRT
<213> *Heliothis virescens*

<400> 6
Met Ala Pro Met Leu Ala Ala Leu Ala Leu Ala Leu Leu Pro Val
1 5 10 15
Ser Glu Gln Gly Pro His Glu Lys Arg Leu Leu Asn Ala Leu Leu Ala
20 25 30

Asn Tyr Asn Thr Leu Glu Arg Pro Val Ala Asn Glu Ser Glu Pro Leu
 35 40 45
 Glu Val Arg Phe Gly Leu Thr Leu Gln Gln Ile Ile Asp Val Asp Glu
 50 55 60
 Lys Asn Gln Leu Leu Ile Thr Asn Ile Trp Leu Ser Leu Glu Trp Asn
 65 70 75 80
 Asp Tyr Asn Leu Arg Trp Asn Asp Ser Glu Tyr Gly Gly Val Lys Asp
 85 90 95
 Leu Arg Ile Thr Pro Asn Lys Leu Trp Lys Pro Asp Val Leu Met Tyr
 100 105 110
 Asn Ser Ala Asp Glu Gly Phe Asp Gly Thr Tyr Gln Thr Asn Val Val
 115 120 125
 Val Arg Ser Gly Gly Ser Cys Leu Tyr Val Pro Pro Gly Ile Phe Lys
 130 135 140
 Ser Thr Cys Lys Met Asp Ile Ala Trp Phe Pro Phe Asp Asp Gln His
 145 150 155 160
 Cys Asp Met Lys Phe Gly Ser Trp Thr Tyr Asp Gly Asn Gln Leu Asp
 165 170 175
 Leu Val Leu Lys Asp Glu Ala Gly Gly Asp Leu Ser Asp Phe Ile Thr
 180 185 190
 Asn Gly Glu Trp Tyr Leu Ile Gly Met Pro Gly Lys Lys Asn Thr Ile
 195 200 205
 Thr Tyr Ala Cys Cys Pro Glu Pro Tyr Val Asp Val Thr Phe Thr Ile
 210 215 220
 Met Ile Arg Arg Arg Thr Leu Tyr Tyr Phe Phe Asn Leu Ile Val Pro
 225 230 235 240
 Cys Val Leu Ile Ser Ser Met Ala Leu Leu Gly Phe Thr Leu Pro Pro
 245 250 255
 Asp Ser Gly Glu Lys Leu Thr Leu Gly Val Thr Ile Leu Leu Ser Leu
 260 265 270
 Thr Val Phe Leu Asn Leu Val Ala Glu Thr Leu Pro Gln Val Ser Asp
 275 280 285
 Ala Ile Pro Leu Leu Gly Thr Tyr Phe Asn Cys Ile Met Phe Met Val
 290 295 300
 Ala Ser Ser Val Val Leu Thr Val Val Val Leu Asn Tyr His His Arg
 305 310 315 320
 Thr Ala Asp Ile His Glu Met Pro Gln Trp Ile Lys Ser Val Phe Leu
 325 330 335

B

Gln Trp Leu Pro Trp Ile Leu Arg Met Ser Arg Pro Gly Lys Lys Ile
340 345 350

Thr Arg Lys Thr Ile Met Met Asn Thr Arg Met Arg Glu Leu Glu Leu
355 360 365

Lys Glu Arg Ser Ser Lys Ser Leu Leu Ala Asn Val Leu Asp Ile Asp
370 375 380

Asp Asp Phe Arg His Gly Pro Pro Pro Pro Asn Ser Thr Ala Ser Thr
385 390 395 400

Gly Asn Leu Gly Pro Gly Cys Ser Ile Phe Arg Thr Asp Phe Arg Arg
405 410 415

Ser Phe Val Arg Pro Ser Thr Met Glu Asp Val Gly Gly Gly Leu Gly
420 425 430

Ser His His Arg Glu Leu His Leu Ile Leu Arg Glu Leu Gln Phe Ile
435 440 445

Thr Ala Arg Met Lys Lys Ala Asp Glu Glu Ala Glu Leu Ile Ser Asp
450 455 460

Trp Lys Phe Ala Ala Met Val Val Asp Arg Phe Cys Leu Phe Val Phe
465 470 475 480

Thr Leu Phe Thr Ile Ile Ala Thr Val Ala Val Leu Leu Ser Ala Pro
485 490 495

His Ile Ile Val Gln
500

s:\ksl\JA0021
111699